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# LOCATOR DEVICE FOR MEDICAL PROCEDURES ON THE BODY SURFACE AND METHOD OF ITS USE

## TECHNICAL FIELD

The present invention relates generally to medical devices and methods. More specifically, the invention relates to devices and methods, including those for delineating portions of a body surface during a procedure, creating tension on the body surface during procedure and/or providing fiducials in image-guided procedures.

## BACKGROUND

There are numerous surgical, cosmetic, therapeutic and dermatological procedures that involve precise placement of medical instruments on a body surface and/or the need to repeat a procedure multiple times at various locations on a body surface. Hair transplantation surgery is one example of such procedures, and it typically involves harvesting donor hair grafts from “donor areas,” and implanting them in one or more bald areas (“recipient areas”). Hair transplantation surgery is a very labor-intensive and complex procedure that requires great skill and precision. When performed completely manually, hair transplantation surgery typically requires multiple, lengthy surgical procedures performed over time. As such, the assignee of the present application has developed an image-guided system for harvesting follicular units from a body surface, as described for example in U.S. Patent Publication Number 2007/0106306, which is hereby incorporated by reference. Image guidance is often used to direct movement of automated systems, such as a system for harvesting and implanting follicular units and/or performing other procedures on the skin or other body surfaces. One example of an image-guided, automated method and system is described in U.S. Patent Publication Number 2012/0158019, which is hereby incorporated by reference.

In performing a procedure on a body surface of a patient, it is often necessary or desirable to perform the procedure on multiple portions of the body surface, with each subsequent portion located immediately adjacent to the prior portion so that there are no gaps between, or overlap of, the multiple body surface portions. In other procedures, it may be desirable to have specific and/or consistent amounts of gaps or overlaps between the multiple body surface portions. Also, using some automated systems, such as those described in reference to certain embodiments of the above-referenced patent applications, it may also be necessary to use fiducial markers to guide the system to perform the procedure. In any of these cases, it can be challenging performing a procedure on multiple body surface portions located in desired locations relative to one another. Typically, for example, this may involve manually moving measuring devices, manually marking skin surfaces, approximating locations where prior procedures were performed, and the like. It can also be challenging to assure proper, stable and consistent positioning of fiducial markers in a treatment area. Various embodiments described below seek to address at least some of these challenges.

## SUMMARY

The various embodiments described herein are directed to devices and methods for performing a procedure on multiple portions of a body surface. Any of a number of different procedures or portions of procedures may be performed,

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using devices and methods described herein. In some embodiments, the devices and methods may simply facilitate or enhance a procedure. In general, as used herein, the phrase “performing a procedure” is meant to also include facilitating and/or enhancing a procedure and/or performing, facilitating and/or enhancing part of a procedure.

The embodiments described herein may be used to perform a procedure on multiple portions of a body surface, where the portions are adjacent and non-overlapping. Alternatively, the same or other embodiments may be used to perform a procedure on multiple portions of a body surface, where the portions are overlapping, for example, by a uniform, desired amount or where a desired amount of gap is present between the body surface portions. The various embodiments described herein typically make it easier to perform procedures on multiple body surface portions at consistent locations relative to one another, such as immediately adjacent to one another.

According to one aspect, to facilitate a procedure on multiple, typically adjacent and non-overlapping, body surface segments, the devices and methods described herein typically involve a locator device with a first portion and a second portion. When the portions are coupled together, they delineate a body surface segment or area on which the procedure may be performed. The first portion may also be detached (fully or partially) from the second portion and moved to a new location, while the second portion remains stationary on the body surface and acts as a reference. Once the first portion is repositioned on the body surface, the second portion can be moved to rejoin the first portion, thereby delineating a second body surface segment on which the procedure may be performed. This process may be repeated as often as desired to perform a procedure on a desired number of body surface segments or areas.

In some embodiments, the locator device simply acts as a locator (or “positioner”) for helping delineate multiple body surface portions for the procedure. Optionally, the locator device may also act as a skin/scalp tensioner. In other embodiments, the locator device may include multiple fiducials (or “fiducial markers”) for guiding an image-guided system that performs the procedure. In some embodiments, the locator device may be a skin/scalp tensioner and also include fiducials.

In some embodiments, the locator device may remain in position while a procedure is performed on a delineated body surface portion. In alternative embodiments, the locator device may be used for marking the body surface, the locator may then be moved, and the procedure may be performed on the marked portion of the body surface. In some embodiments, the locator device may include a frame that has a central opening, and the opening delineates the body surface portions. Alternatively, an outer edge or some other feature(s) of the locator device may delineate the body surface portions in other embodiments.

According to one aspect of the present application, a method for performing a procedure on a body surface of a patient is provided. The method comprising: positioning a locator device on the body surface to delineate a first segment of a body surface; performing the procedure on the first segment of the body surface; moving a first portion of the locator device while leaving a second portion of the locator device stationary, the second portion providing a reference to guide movement of the first portion relative to the second portion; and moving the second portion of the locator device to reform the locator device and delineate a second segment of the body surface. In some embodiments, the first portion of the locator device, or the second portion of the locator device or both